

### Abstract

A fiber amplifier comprises an amplifying double-clad fiber (DCF). The fiber has a core having a first refractive index, an inner cladding surrounding the core and having a second refractive index lower than the first refractive index and an outer cladding surrounding the inner cladding. The core is doped with Erbium (Er) and co-doped with Ytterbium (Yb), and further co-doped with Cerium (Ce). The Ytterbium (Yb) enables pump energy transfer from Ytterbium (Yb) ions being in the excited state to Erbium (Er) ions being in the ground state ( $^4I_{15/2}$ ). The Cerium enables a resonant energy transfer between the Erbium (Er) excited state ( $^4I_{11/2}$ ) and Cerium (Ce) ground state ( $^4F_{7/2}$ ). This leads to a lower population of the Erbium  $^4I_{11/2}$  state and thereby increases energy transfer from Ytterbium to Erbium.